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Surveying

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Q.No.1 What is the Transition Curve? How Super Elevation is effected by the speed of vehicle and radius of the Curve? Prove it with the help of equation and diagram?

Ans.:

A transition Curve may be defined as Curve of varying radius of infinity at tangent point to a design Circular Curve radius provided in between the Straight and circular path in order that the centrifugal force was gradual, this is also known as easement Curve

Types:

- There are three types of transition
- 1) cubic parabola (railways)
  - 2) Clothoid or super (railways)
  - 3) Lemniscate (Highways)

Super elevation

It is the amount by outer edge of Curve on a road or railway is banked above the inner edge when vehicle pass to a curved path the following forces act on it.

- (i) weight of vehicle
- (ii) Centrifugal force both acting through centre of gravity of vehicle

the effect of centrifugal force is to push

the vehicle off the track. Now if contact

the action. The plane of the road surface is made perpendicular to resultant of centrifugal force and weight of vehicle. In other words

the outer bank of road is raised above the inner one. The raising of the outer bank over the inner one is known as

Superelevation.

Mathematically

$W$  = Weight of vehicle

$P$  = Centrifugal force

$V$  = Speed of vehicle (m/sec)

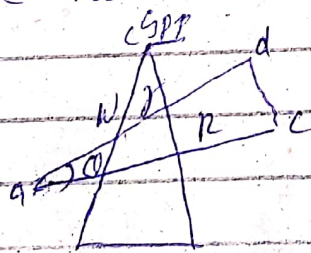
$g$  = acceleration due to gravity

$R$  = radius of curve

$h$  = Super elevation in m

$b$  = width of road in m

$G$  = distance b/w centre of rails.



For equilibrium

the resultant of weight and centrifugal force must be equal and opposite to the reaction perpendicular to road

As we know that

$$P = \frac{WV^2}{gR}$$

$$P/w = \frac{v^2}{gR}$$

If  $\theta$  is the inclination of road surface  
the inclination of resultant to vehicle is  
also  $\theta$ . So we have

$$\tan \theta = \frac{de}{ac} = P/w = \frac{bv^2}{gR}$$

on Road

$$b \tan \theta = \frac{v^2}{gR}$$

on railways

$$b \tan \theta = \frac{Gv^2}{gR}$$

Radius:

$$b \tan \theta = \frac{v^2}{gR}$$

$$R = \frac{v^2}{b \tan \theta g} \quad (\text{for roads})$$

$$b \tan \theta = \frac{Gv^2}{gR}$$

$$R = \frac{Sv^2}{btan\theta} \quad (\text{for railway})$$

Speed of vehicle

$$btan\theta = \frac{v^2}{gn}$$

$$v^2 = \frac{btan\theta gn}{1}$$

$$v = \sqrt{btan\theta gn}$$

(for roads)

$$btan\theta = \frac{Sv^2}{gn}$$

$$v^2 = \frac{btan\theta gn}{S}$$

$$v = \sqrt{\frac{btan\theta gn}{S}}$$

for railway

Q.No.2: What is the difference b/w triangulation and trilateration? Also explain the principal of triangulation and trilateration

Ans..

Triangulation.

- ① All the angles are measured in triangulation
- ② Distance of base line are also measured to control scale error
- ③ Some check base lines are also measured to control scale error
- ④ intervisibility b/w station is essential

Trilateration

- ① All sides are measured in trilateration
- ② Azimuth of initial line is measured
- ③ Some check angles are measured to control azimuth error
- ④ for small areas it is possible to measure distance without intervisibility.

Principal of triangulation

in triangulation all the three angles of each triangle are in the field along with one base line.

The side of the 1st triangle whose length is predetermined is called base line and vertices of the individual triangles are known as stations

To minimize accumulation of errors in length subsidiary bases are at suitable intervals are provided

## Principal of triangulation

the method of surveying in which the length of the sides of triangles are measured and from this information angles are computed. This method does not involve the

measurements of angles

→ It is a method of control survey in which a network of triangles is used as in triangulation.

→ All the three sides of each triangle are measured in the field.

Q No: 3

(b) What is sounding and purpose of sounding. Also explain name the equipment used to determine sounding.

Ans: Sounding:

The process of determining depth below the water surface is called sounding.

Sounding is analogous to levelling on land.

The reduce level of any point on the bottom of water body is obtained by subtracting the sounding from the mean sea level.

Purpose of Sounding :

① Preparation of accurate chart for navigation

② Determination of the quantities of the material to be filled

③ obtaining information for design of breakwaters, sea wall etc equipment

- ① sounding boat ② rods and piles ③ lead lines

Q.No.3 What is hydrographic Survey, why we do it part(a) and what are feature to determined while conducting hydrographic Survey?

Ans. Hydrographic Survey:

It is the branch of applied science which deals with the measurement of the physical features of oceans, seas, coastal areas lakes and rivers

Hydrographic Survey is mainly conducted under authority concern. It is mainly carried by means of Sounding or electronic Sounding System

Why we do Hydrographic Survey

- ① depth of bed can be determined
- ② Shore line can be determined
- ③ locating sewer fact by measuring direct current
- ④ locating mean sea level.
- ⑤ Tide measurement
- ⑥ river and stream discharge measurement
- ⑦ massive structure like bridge dams are planned



## Factor determined while conducting hydrographic survey

Following are the factors

- ① Survey equipment
- ② Preparation of a hydrographic survey
- ③ Issue to a designated unit
- ④ programming planning of that unit
- ⑤ assessment of the task with in that unit
- ⑥ Reconnissance requirement
- ⑦ Resource allocation
- ⑧ Detailed Survey planning
- ⑨ ~~Plan~~ Plans for completion and checking of data.

Q No. 4 What is the Aerial photogrammetry and why we do it.

Ans: Aerial photography is the taking of photographs from an aircraft or other flying object. Platforms for aerial photography include fixed-wing aircraft, helicopters, unmanned aerial vehicles, balloons, blimps and dirigibles, rockets, pigeons, telescope

Why we do it

- ① vertical aerial photography in Cartography
- ② topographic maps
- ③ land-use planning
- ④ Archaeology
- ⑤ oblique photography for movie production
- ⑥ environmental studies
- ⑦ power line inspection
- ⑧ commercial advertising  
conveyancing
- ⑨ Surveillance construction progress
- ⑩ artistic projects.

b. Shortly explain the procedure of aerial photography

Ans.: ① Establishing control points.

② flight planning and photography

③ photo interpretation and stereoscopy

④ Parallax and measurement of parallax

⑤ construction of map and cartography